Original Article

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Effect of Global Postural Re-education on Pain, Disability, And Posture in Desk Job Workers with Nonspecific Neck Pain: Randomized Control Trial

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Abstract:

Objective: To study the effect of Global postural re-education (GPR) on pain, disability, and posture in patients with chronic nonspecific neck pain.

Material and Methods: A single-blinded randomized control trial was conducted. A total of 45 individuals, with nonspecific neck pain aged between 20-40 years, with Craniovertebral Angle (CVA) of less than 49 degrees, were randomly assigned to either the GPR or control group, according to inclusion and exclusion criteria. The intervention was twice a week, spanning four weeks. Outcome measures included: the Numerical Pain Rating Scale (NPRS) for pain intensity, the Neck Disability Index (NDI) for disability assessment and the CVA for posture evaluation.

Results: To establish the difference between the groups, the Mann-Whitney U test was performed, and within-group analysis was performed by the Wilcoxon sign rank test. NPRS showed significant improvement (p-value=0.02). NDI did not show significant improvement (p-value=0.83); CVA showed significant improvement (p-value=0.0009).

Conclusion: This study concludes that GPR was more effective in reducing pain, increasing function, and improving posture than the control group and can be used in regular practice with proper setup.

Keywords: CVA, desk job workers, forward head posture, global postural reeducation, nonspecific neck pain

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Introduction

Work-related musculoskeletal diseases (WRMSD), also known as overuse disorders or repetitive strain injuries, are caused by job risk factors. Neck pain is a significant concern for individuals who spend prolonged hours at desks, leading to issues in the musculoskeletal, peripheral nervous, and neurovascular systems[1]. Four hundred forty one participants were included in the study. Of them, 58% were males. Majority of participants aged between 31-50 years. One-year prevalence of neck pain and WRNP was reported as 43.3%, (95% confidence interval (CI) 38.7%-47.9% Excessive computer use and awkward postures contribute to work-related neck pain (WRNP), with prolonged flexion of the neck resulting from forward head postures. This acquired posture, often exacerbated by texting or handheld device use, leads to repeated stress injuries, with women being more prone to neck pain than men[2]. The negative impact of WRNP on individual and community health is notable. Ergonomics, involving the design of work environments for safety and comfort, is crucial in addressing musculoskeletal pain among office workers[3]. Workplace furniture, office equipment, and musculoskeletal disorders. The respondents were office workers who were professionals, managers and administrative workers. Result: The results revealed that 80% of the respondents suffered from atleast one musculoskeletal problem at their workplace. Majority of the respondents reported of suffering from lower back pain (68.5%).

Mersky defined neck pain as: "pain anywhere within the region bounded superiorly by the superior nuchal line, inferiorly by an imaginary line through the tip of the first thoracic spinous process, and laterally by a sagittal plane tangential to the lateral borders of the neck[4].

Neck discomfort can be categorized as specific or nonspecific neck pain. Specific neck pain is localized to the cervical spine and is often linked to identifiable conditions, injuries, or pathologies. In contrast, nonspecific neck pain lacks a discernible cause.

Nonspecific neck pain is defined as cervical pain without a specific, identifiable anatomopathological diagnosis and when the cause of the pain symptoms is unknown.5 Many factors can lead to the development of nonspecific neck pain, such as maintaining poor posture, such as slouching or having a forward head position, which can strain the neck muscles and contribute to pain. Although nonspecific neck pain can be very unpleasant, it is not dangerous.

Diagnosis of nonspecific neck pain

The Bone-joint Decade between 2000 and 2010 Neck Pain Task Force's Classification[5]:

Grade 1: No signs of pathology and little or no interference with daily activities.

Grade 2: Signs of pathology caused by interference with daily activities

Grade 3: Neurologic signs of nerve compression

Grade 4: Signs of major pathology.

The three primary clinical questions for diagnosing nonspecific neck discomfort are:

1. How do you assess someone with Neck pain?

• First, eliminate red signs of significant disease; such as radicular discomfort or radiculopathy.

• Secondly, consider the prognostic factors: old age, pathological radiological findings (degenerative changes in the disc or joint), and history of previous attacks.

2. Confirm or exclude radicular pain /radiculopathy, with the combination of the following assessment.

• Spurling test.
• Neck Distraction & traction test.
• Upper Limb Tension Test (ULTT).

3. How do you evaluate pain intensity and disability?

• The "Neck Disability Index" is the most verified instrument for self-related disabilities, and the "Numerical Pain Rating Scale" is the most verified instrument for pain intensity.

Forward head posture

Desk jobs contribute significantly to musculoskeletal issues, with 35% of individuals experiencing prevalent neck discomfort and forward head posture; surpassing the rates within the general community. Forward head posture, characterized by misalignment of the head and neck, is linked to various musculoskeletal problems and neck pain.[6]conducted in Fatima Memorial College of Medicine and dentistry, Lahore from 18 October, 2017 to 30 January, 2018. Reed co postural assessment scale score was used for the postural assessment, upper limb functional index (ULFI This posture induces changes in the cervical spine, leading to increased lordosis, extension, and flexion, accompanied by altered angles. Muscular imbalances; such as proximal cross syndrome[6], Conducted in Fatima Memorial College of Medicine and dentistry, Lahore from 18 October, 2017 to 30 January, 2018. Reed co postural assessment scale score was used for the postural assessment, upper limb functional index (ULFI commonly arise in prolonged desk job scenarios, causing weakened anterior neck muscles, shortened posterior cervical muscles, and myofascial pain.[7] These imbalances also affect shoulder muscles, contributing to altered glenohumeral orientation and kinematics; resulting in neck and shoulder pain[8]. Forward head posture's impact extends beyond musculoskeletal issues, affecting muscle proprioception[9,10], respiratory function[11], and static equilibrium[12]. Nonspecific neck discomfort is prevalent in the population, emphasizing the importance of addressing these postural issues to prevent long-term musculoskeletal complications associated with desk work.

Pathophysiology

Cervical position sense relies on passive constraints like ligaments and tendons alongside the unique cervical vertebrae anatomy. Proprioception, assessing spatial awareness, is vital and can be evaluated through tests, with training recommended in spinal pain rehabilitation[13]. it bends in the sagittal plane producing greater lordosis. The determination of critical load in Euler's sense requires blocking of this sagittal plane bending. A special apparatus was developed that constrained such bending in the sagittal plane, but allowed complete freedom of the spine motion in the frontal plane. Experiments were conducted to determine the axial force-lateral bending curves of whole cervical spine specimens. Critical load values were obtained from these curves. As an alternative to this method, bending stiffness in the frontal plane was experimentally determined and the critical load was computed using Euler's theory of columns. Results. Based upon the study of seven spine specimens (CO-T1 Despite osteoligamentous structures contributing only 20% to cervical spine mechanical integrity, the remaining 80% is managed by cervical muscles, emphasizing their crucial role in maintaining structural stability[14]. Damage to these muscles can disrupt communication with muscle spindles, potentially contributing to neck discomfort.

Treatment

Many physiotherapy treatments have been demonstrated to benefit patients with chronic, nonspecific neck pain. Therapeutic exercises, such as stretching, strengthening, and muscle release techniques, are crucial interventions that can be used alone or in combination with other manual therapy treatments, like manual therapy. Global Postural Reeducation (GPR), originating from Françoise Mézières' concept of "anti-gymnastique," is an innovative physiotherapy method designed by Philippe Souchard. Developed in the 1950s, GPR addresses postural dysfunctions by targeting muscle chain retractions through joint decompressions, active muscle stretching, breath control, and motor control exercises.

The method, grounded in the theory of muscle chains, actively stretches muscles to reduce motoneuron excitation, influencing both pre and postsynaptic mechanisms. GPR's key principles; including Causality, Globality, and Muscle chain distribution, align with the regional interdependence paradigm in musculoskeletal rehabilitation. GPR is used in various conditions to improve posture, alleviate pain, and enhance musculoskeletal conditions, such as ankylosing spondylitis, temporomandibular joint dysfunction, fibromyalgia, chronic neck, and back pain, respiratory conditions and many more. By focusing on stretching and activating muscles, GPR promotes muscle balance, postural symmetry, and broader musculoskeletal improvements beyond local borders[15–18].

Neck pain and forward head posture are common in desk job workers, with a prevalence of 35%, often due to altered posture and biomechanics. Traditional treatments focus on specific causes, while GPR addresses muscle groups holistically, respecting their physiology and pathophysiology to balance muscle tone, improve flexibility, and reduce tension. Given the lack of studies on GPR's impact on neck pain, further research is needed to enhance treatment outcomes. Therefore, this study aimed to assess the effect of GPR on pain, using the Numeric Pain Rating Scale (NPRS), with Neck Disability Index (NDI) for function, and posture using the cervical vertebral angle (CVA).

Material and Methods

Design

A single-blinded randomized control trial was conducted; in which the participants were blinded.

Registry

Ethical clearance was obtained from the Institutional Ethical Committee of Dr. D.Y. Patil College of Physiotherapy, Pune, India, with DYPCPT/IEC/23/2023 on 16/3/2023. CTRI registration number: CTRI REF/2023/06/053491.

Setting

The treatments were given at the outpatient department of Dr. D.Y. Patil, College of Physiotherapy, Pimpri Pune; India.

Sample size calculation

Sample Size was calculated using Statistical software G-power version 3.1, assuming the effect size of 0.4, alpha error prob of 0.005, and power (1-beta error prob) of 0.8, with the sample size being calculated as 41 for both groups.

Participants

The study included both males and females, aged 20 to 40 years, with a cranio-vertebral angle of less than 49 degrees and who spend 50% of their working time at a desk, with or without a computer/screen. The average pain intensity on the NPRS was required to be less than 8, and participants should have a history of 4-6 hours of work[18]. The following criteria were excluded: specific causes of cervical pain, radiculopathies, cognitive decline, history of cervical surgery, known or suspected vestibular pathology, and lower limb pathologies. Exclusion criteria involved Harris hip scores below 80 and MOCA scale scores below 26, ensuring the absence of lower limb pathology and assessing cognitive status. The dropout criteria for the participants were: if the participant experiences palpitation, muscle cramps, excessive diaphoresis, dizziness, tingling, or discomfort in the lower limb.

Recruitment, randomization and blinding procedures

Recruitment took place between September 2023 and December 2023, when patients attended the Outpatient Department of Dr. D. Y. Patil College of Physiotherapy, Pune. Out of the initially screened 90 individuals with neck pain complaints, 45 that met the inclusion criteria were recruited. Demographic details, desk working hours, and Jindal's criteria for non-specific neck pain classification guided the screening.

Participants, after receiving a detailed study explanation, were provided with informed written consent. Using simple random sampling, participants were then allocated into Group A (Global Postural Reeducation) or Group B (control), both undergoing exercise sessions twice weekly for four weeks. Shown in consort chart (Figure 1).

Outcome measures:

The The outcome measures were taken pre and post four-week.

Primary outcomes focused on evaluating pain using the NPRS. The NPRS, an 11-point scale (0 to 10), assesses neck pain intensity and is known for its reliability (r=0.76) and validity compared to the VAS[19]. Assessing functionality through the NDI, the NDI scale evaluates neck pain impact on daily life through 10 checkpoints, providing nuanced disability scores ranging from 0 to 5[20]. To evaluate posture, the CVA angle was measured using MB ruler software. MB ruler software reported a very high value in inta-rater reliability, with Intraclass correlation coefficient (ICC) 0.999, and inter-rater, with ICC 0.892 reliability in assessing craniovertebral (CV) angle[21]. Additionally, the cervical range of motion using a Universal Goniometer served as a secondary outcome measure.

Intervention

The intervention lasted a total of four weeks, twice a week. During this, the respective participants were treated according to their groups of either the global postural re-education or the control group. In global postural re-education, the individual was placed into 2 positions. First in the supine position, while stretching the anterior and posterior muscle chains, and secondly in a standing position.

In the control group the standard protocols under NICE guidelines for neck pain was given.

GPR group (group A)

The GPR exercise protocol comprises three positions: two lying down and one standing, with sessions lasting 35-40 minutes. Phase 1 (Figure 2) focuses on lying postures without gravitational load. Phase 1A targets the anterior muscle chain through stretching and contractions; emphasizing breathing and correct alignment. By positioning the subject with the upper limbs positioned at a 45-degree angle of abduction and flexed, the hips are abducted and laterally rotated, with the soles of the feet touching each other. In this position, 4 minutes of stretching, 10 minutes of contractions, stretch reflexes, manual tractions, and prolonged elongations are undertaken. After completing phase 1A of the protocol a rest period of 2 minutes is given to the participant. Phase 1B (Figure 3) focuses on the posterior muscle chain, employing similar techniques for stretching and alignment correction. By positioning the patient with the lower limbs flexed at 90 degrees at the hips, and upper limb in abduction. Time/Mode: 10 minutes (contractions, stretch reflexes, manual tractions, and continuous elongations)

After a 2-minute rest, Phase 2 (Figure 4) transitions to standing, integrating postural corrections under gravitational load, emphasizing limb extension and alignment, and promoting deep rhythmic breathing for 5 minutes of relaxation.

Cervical mobility, streches and isometrics were taught as a maintence phase and were asked to performed at home. The exercises were monitored, and any queries about them were resolved through telecommunication.

Control group (group B)

In the control group, participants followed a NICE guideline-based protocol comprising several interventions aimed at addressing cervical issues and enhancing mobility. This included a 10-minute application of a hot, moist pack, followed by 10 repetitions of cervical mobility exercises. Additionally, participants performed specific cervical stretches targeting the Trapezius and Levator Scapulae muscles, each held for 30 seconds and repeated three times. They also engaged in cervical isometric exercises involving flexion, extension, rotation, and side bending, with each hold lasting 10 seconds and repeated for 10 repetitions. These interventions collectively aimed to alleviate tension, improve flexibility, and strengthen the cervical muscles. The total time required for intervention was 30 minutes. All these exercises were first taught and participants were then asked to follow the same training at home, for a minimum of once a day. Exercises were monitored, and any queries about them were resolved through telecommunication.

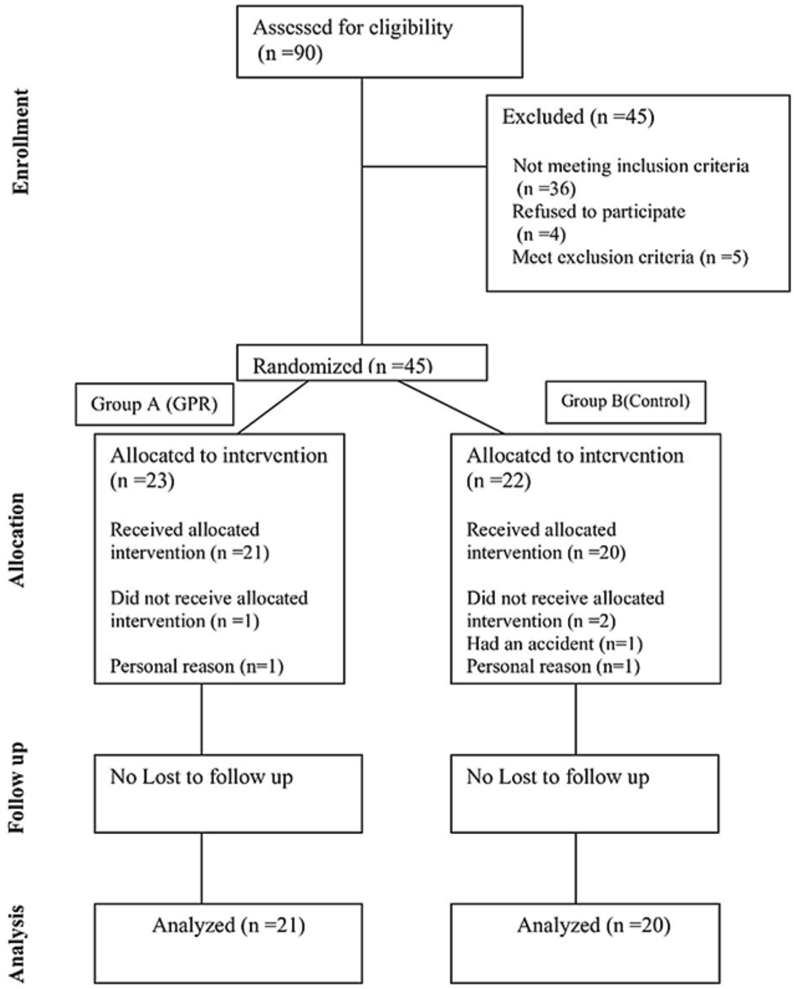

Figure 1 Consort flowchart

Figure 2 Phase 1A: Lying posture for stretching of the anterior chain muscles

Figure 3 Phase 1B: Lying posture for stretching the posterior chain muscles

Figure 4 Phase 2: Standing posture incorporating under gravity load

Data analysis

Data analysis was performed using Statistical Package for the Social Science (SPSS) version 26.0, with a significance level set at p-value<0.05. Descriptive statistics; including mean and standard deviation, characterized key features within each group. The Shapiro-Wilkinson test assessed data normality, which showed that the data was not normally distributed, guiding the use of non-parametric tests (Mann-Whitney U for between-group and Wilcoxon Signed-Rank for within-group comparisons). This comprehensive approach, combining descriptive and inferential statistics, enabled effective identification of significant differences in the data.

Results

The total number of participants in the study was 41, with 21 in one group and 20 in another group. Out of all the participants, 80% were female, and 20% were male. Table 1 presents mean and standard deviation values for age, body mass index (BMI), and desk hours in both the GPR and Control groups. The Mann-Whitney U test revealed no significant age differences (p-value>0.05), and the chi-square test showed comparable gender distribution (p-value>0.05). Additional Mann-Whitney U tests indicated no significant distinctions in height, weight, BMI, or desk hours between the two groups (all p-value>0.05). These findings affirm the groups' baseline comparability, validating their suitability for the study's comparative analysis.

Table 2 indicates a significant deviation in data distribution, per the Shapiro-Wilk test, necessitating non-parametric analysis. For NPRS, the Mann-Whitney U Test reported a statistically significance between-group difference in the POST interval (p-value>0.05). Within-group analysis, using the Wilcoxon matched pair rank test, no statistically significant results were revealed for both the GPR and CONTROL group (p-value 0.05). A higher mean difference in pain reduction was observed in the GPR group (6.05>5.15), highlighting the intervention's greater impact on pain reduction in this group and emphasizing the importance of non-parametric tests due to non-normal data distribution.

In Table 3, the Shapiro-Wilk test indicated non-normal data distribution, prompting non-parametric analysis. For NDI, the Mann-Whitney U Test reported a statistically significant between-group difference in the PRE and POST intervals (p-value>0.05). The Wilcoxon matched pair rank test revealed statistically significant within-group results for both the GPR and CONTROL groups (p-value>0.05). Notably, a higher mean difference in neck impairment reduction was observed in the GPR group (29.48>28.7), highlighting the intervention's greater impact on neck disability in this group. The use of non-parametric tests proved crucial for these insights.

Table 1 Baseline demographic data

Particulars	Group A (n=21)	Group B (n=20)	Z value (Mann Whitney U test)	p-value
Age (in years)				
Mean	24.76	22.8	0.17	0.77
S.D.	4.81	1.12		
BMI (Kg/m^2)				
Mean	25.2	23.26	0.08	0.87
S.D.	4.06	3.75		
No of hours sItting on desk				
Mean	7.33	6.65	0.18	0.83

BMI=body mass index

In Table 4, the Shapiro-Wilk test indicated non-normal data distribution, leading to non-parametric analysis. For CVA, the Mann-Whitney U Test reported a statistically significant between-group difference in the POST interval (p-value>0.05). The Wilcoxon matched pair rank test did not yield any statistically significance within-group results for both the GPR and CONTROL groups (p-value>0.05). Importantly, a higher mean difference in cervical vertebral angle change was observed in the GPR group (8.86>3.5), indicating the greater impact of the intervention on the GPR group's cervical posture.

Table 2 Within group and between group comparison of the NPRS

Particulars	Group A	Group B	z-value (Mann Whitney U test)	P-value
NPRS				
Pre	7±1.02	6.9±0.94	0.32	0.89[NS]
Post	0.95±0.84	1.75±1.33	2.27	0.02*
z-value	20.47	14.14		
p-value (Wilcoxon pair test)	0.0015*	<0.0001*		
Difference	6.05±0.90	5.15±0.98		

*p-value<0.05 is statistically significant, [NS]p-value>0.05 is not statistically significant, NPRS=the numeric pain rating scale

Table 3 Within group and between group Comparison of NDI

Particulars	Group A	Group B	z-value (Mann Whitney U test)	p-value
NDI				
Pre	34.52±16.17	33.5±13.39	0.03	0.94[NS]
Post	5.04±3.24	4.8±3.77	0.21	0.83[NS]
z-value	7.99	8.85		
p-value (Wilcoxon pair test)	0.0001*	0.0001*		
Difference	29.48±6.02	28.7±5.08		

*p-value<0.05 is statistically significant, [NS]p-value>0.05 is not statistically significant, NDI=the neck disability index

Table 4 Within group and between group comparison of CVA

Particulars	Group A	Group B	z-value (Mann Whitney U test)	p-value
CVA				
Pre	43.33±5.88	43.55±4.18	0.13	0.89[NS]
Post	52.19±5.41	47.05±4.98	3.12	0.0009*
z-value	4.95	2.40		
p-value (Wilcoxon pair test)	0.0001*	0.0001*		
Difference	8.86±5.50	3.5±5.00		

*p-value<0.05 is statistically significant, [NS]p-value>0.05 is not statistically significant, CVA=Craniovertebral angle

Discussion

This study aimed to compare the impact of GPR on discomfort, disability, and the posture of desk job workers with nonspecific neck discomfort. The study's aims were to assess the efficacy of GPR for nonspecific neck discomfort.

The study meticulously compared baseline characteristics between the control and GPR groups to ensure any observed effects could be confidently attributed to GPR rather than pre-existing disparities. Parameters; such as age, gender, height, weight, BMI, and desk hours showed non-significant differences, affirming successful participant matching. This enhances internal validity, enabling more reliable conclusions in regard to GPR's specific impacts on pain, disability, and posture compared to the control group.

The objective of the trial was to assess the impact of GPR is on pain using the NPRS. Significant variations in NPRS scores between the GPR and Control groups emphasize the stronger influence of GPR on pain reduction. GPR's focus on addressing postural abnormalities and restoring musculoskeletal alignment, which likely explains the substantial pain reduction observed. The technique involves specific positioning and stretches throughout the anterior and posterior kinetic chains, in which the afferent impulses activate alpha motor neurons in the spinal cord, triggering the stretch reflex, which increases tension in the stretched muscle and decreases activity in the opposing muscle. This is a phenomenon known as reciprocal inhibition causing relaxation in the muscle, subsequently leading to pain relief. Epidemiological studies have suggested persistent neck pain in a considerable percentage of patients, making interventions like GPR crucial. Similar research by Ana Cláudia Violino Cunha demonstrated decreased discomfort and increased ranges with stretching, emphasizing the positive effects of manual therapies[15]. Additionally, a study on myogenic temporomandibular disorder indicated that GPR sessions improved pain and electromyographic activity in patients with temporomandibular problems, albeit with a slight decrease after two months. Overall, these findings underscore the clinical utility and effectiveness of GPR in managing neck pain[22].

In this study, GPR significantly lowered NDI scores, indicating a substantial impact on reducing neck impairment compared to the control group. Additionally, both between-group and within-group analyses supported GPR's effectiveness in decreasing neck impairment. As pain reduces, the functionality of the neck increases; therefore, by improving alignment, this emphasizes the clinical potential of integrating GPR in treating nonspecific neck pain among desk workers.

In this study, GPR demonstrated a significant impact on improving posture, particularly in the CVA; highlighting its efficacy in addressing not only pain and disability but also positively influencing the posture of desk job workers with nonspecific neck pain. The global approach of GPR, focusing on individual muscle chains and promoting balanced, coordinated posture, contributes to enhanced musculoskeletal well-being. GPR significantly improves posture, as reflected in the CVA, and effectively addresses pain and disability in desk job workers with nonspecific neck pain. This is achieved by treating the body as a whole and focusing on a balanced, coordinated posture. The personalized nature of GPR therapies, targeting individual needs, proves effective in improving flexibility and range of motion, vital for neck health.

This study further emphasized the considerable variation in range of motion (ROM) measures, including flexion, extension, rotation, and lateral flexion, with the GPR group consistently exhibiting a higher mean difference compared to the control group. GPR's incorporation of targeted workouts, strategies, and joint mobilization procedures contributes to resolving muscular imbalances and enhancing the cervical range of motion. This comprehensive approach, involving breathing techniques and focused stretching movements, underscores the importance of integrating GPR into workplace wellness programs for desk workers, as it promotes better posture, reduces absenteeism, increases productivity, and enhances overall employee well-being.

Both groups showed improvement, as both treatments addressed the neck pain; however GPR is more beneficial as it targets complete kinetic chain and addresses the root cause as postural alignment and muscle balance. In this study, this holistic approach led to more long-term pain relief compared to the control group, which showed a significant postural correction compared to the control group.

Conclusion

This study concluded that both GPR and conventional treatments effectively reduce pain, increase functionality, and improve cervical range of motion in patients with nonspecific neck discomfort. However, GPR demonstrated significant improvement in posture among desk job workers with nonspecific neck pain compared to the control group.

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Conflict of interest

The authors declare there are no conflicts of interest.

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